

G.B. TECHNICAL UNIVERSITY, LUCKNOW



Syllabus

3rd & 4th Year

[Effective from session 2010-11]

B. Tech. Civil Engineering

G. B. TECHNICAL UNIVERSITY , LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2010-11

Third Year , V Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	EHU501	Engineering & Managerial Economics	3	1	0	30	20	50	100	150	3
2	ECE501	Geotechnical Engg	3	1	0	30	20	50	100	150	4
3	ECE504	Structural Analysis -2	3	1	0	30	20	50	100	150	4
4	ECE505	Design of Concrete Structures – 1	3	1	0	30	20	50	100	150	4
5	ECE502	Transportation Engg -1	2	1	0	15	10	25	50	75	3
6	ECE503	Environmental Engg -1	2	1	0	15	10	25	50	75	3
PRACTICAL / DESIGN / DRAWING											
7	ECE551	Geotechnical Engg lab	0	0	3	10	10	20	30	50	1
8	ECE552	Transportation lab	0	0	3	10	10	20	30	50	1
9	ECE553	Cad Lab – 1	0	0	3	10	10	20	30	50	1
10	ECE554	Quantity Surveying & Estimation	0	0	1	10	10	20	30	50	1
11	GP 501	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	16	6	10					1000	26

G. B. TECHNICAL UNIVERSITY , LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2010-11

Third Year , VI Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	EHU601	Industrial Management	3	0	0	30	20	50	100	150	3
2	ECE602	Environmental Engg -2	3	1	0	30	20	50	100	150	4
3	ECE011- ECE014	Departmental Elective-I	2	1	0	15	10	25	50	75	2
4	ECE021- ECE024	Departmental Elective-II	3	1	0	30	20	50	100	150	4
5	ECE601	Design of Concrete Structures – 2	3	1	0	30	20	50	100	150	5
6	ECE603	Transportation Engg - 2	2	1	0	15	10	25	50	75	3
PRACTICAL / DESIGN / DRAWING											
7	ECE653	Cad Lab-2	0	0	3	10	10	20	30	50	1
8	ECE652	Environmental Engg lab	0	0	3	10	10	20	30	50	1
9	ECE651	Structural Detailing Lab	0	0	3	10	10	20	30	50	1
10	ECE654	Survey Camp**			-	-	-	50	-	50	1
11	GP 601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	16	5	9					1000	26

** - This will be done during Winter Break for one week WITH THE HELP OF TOTAL STATION AND DIFFERENTIAL GPS

Note : 4 weeks Industrial Training after VI Sem. to be evaluated in VII semester.

G. B. TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2011-12

Final Year , VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	EOE071- EOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	ECE031- ECE034	Department Elective-III	3	1	0	30	20	50	100	150	4
3	ECE041- ECE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	ECE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	ECE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	ECE751	Seminar	0	0	4		-	50	-	50	1
7	ECE752	Industrial Training**					-	50	-	50	1
8	ECE753	Project#	0	0	4		-	100	-	100	3
9	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

G. B. TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2011-12

Final Year , VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	EOE081- EOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	ECE051- ECE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	ECE061- ECE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	ECE801	Construction Technology & Management	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	ECE851	Project	0	0	12		100	100	250	350	8
6	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24

MODIFIED LIST OF PROFESSIONAL / DEPARTMENTAL ELECTIVES

Departmental Elective-I

ECE 011 - Advanced Foundation Design
ECE 012 - Matrix Analysis of Structures
ECE 013 - Environmental Management for Industries
ECE 014 - Principles of Town Planning and Architecture

Departmental Elective-II

ECE 021 - Advanced Concrete Design
ECE 022 - Earth and Earth Retaining Structures
ECE 023 - Transportation System and Planning
ECE 024 - Rural Water Supply and Sanitation

Departmental Elective-III

ECE 031 - Bridge Engineering
ECE 032 - Finite Element Methods
ECE 033 - Environmental Geo-technology
ECE 034 - Industrial Pollution Control & Env. Audit
ECE 035 – Engineering Hydrology

Departmental Elective-IV

ECE 041 - Precast and Modular Construction Practices
ECE 042 - Plastic Analysis of Structures
ECE 043 - Open Channel Flow
ECE 044 – Tunnel Engineering

Departmental Elective-V

ECE 051 - Computer Aided Design
ECE 052 - Analysis and Design of Hydraulic Structures
ECE 053 - Water Resources Systems
ECE 054 - Machine Foundation Design

Departmental Elective-VI

ECE061 - Ground Improvement Techniques
ECE 062 - River Engineering
ECE 063 – Groundwater Management
ECE 064 - Earthquake Resistant Design of Structures

ECE – 501

GEOTECHNICAL ENGINEERING

L – 3, T – 1 CT – 30, TA – 20, ESE - 100

UNIT – 1

Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Clay minerals, Index properties, Particle size analysis, Soil classification. 8

UNIT – 2

Soil-water systems, capillarity-flow, Darcy's law, permeability, field and lab tests, piping, quick sand condition, seepage, flow nets, flow through dams, filters. Soil compaction, water content – dry unit weight relationships, OMC, field compaction control, Proctor needle method. 8

UNIT – 3

Effective stress principle, Stresses due to applied loads, Boussinesq and Westergaard equations. Compressibility and consolidation characteristics, Rate of consolidation, Terzaghi's one dimensional theory of consolidation and its applications, Over Consolidation Ratio, determination of coefficient of consolidation and secondary consolidation (creep), consolidation under construction loading. 8

UNIT – 4

Shear strength - direct & triaxial shear tests, Mohr – Coulomb strength criterion, drained, consolidated, undrained and unconsolidated tests, strength of loose and dense sands, Normally Consolidated and Over Consolidated soils, dilation, pore pressure, Skempton's coefficient. Earth pressure theories, Coulomb and Rankine approaches for c-φ soils, smooth and rough walls, inclined backfill 8

UNIT – 5

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ test, SPT, CPT, DCPT Types of foundations – shallow / deep, isolated, combined, mat, etc., Definitions, Bearing capacity of shallow foundations (Terzaghi analysis), general, local and punching shear failures, corrections for size, shape, depth, water table, Bearing capacity by consolidation method, insitu bearing capacity determination, Provisions of IS code of practice, selection of depth of footing, eccentrically loaded footings. 8

Text Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering

References

1. Alam Singh – Modern Geotechnical Engineering
2. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
3. I.H. Khan – Text Book of Geotechnical Engineering
4. C. Venkataramaiah – geotechnical Engineering
5. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
6. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics

ECE - 502

TRANSPORTATION ENGINEERING I

L – 2, T – 1 CT – 15, TA – 10, ESE – 50

UNIT – 1

Introduction : Role of Transportation, Modes of Transportation, History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road types

and pattern.

Geometric Design : Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

8

UNIT – 2

Traffic Engineering : Traffic characteristic, volume studies, speed study, capacity, density, traffic control devices, signs, signals, design of signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection.

8

UNIT – 3

Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2001), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design. (IRC : 58 – 2002).

8

UNIT – 4

Road Construction Methods : WBM, Surface dressing, bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, Cement Concrete road construction.

8

Text Books

1. Highway Engineering by S. K. Khanna & C.E.G. Justo.

References

1. Transportation Engineering by L. R. Kadiyali.

2. Highway Engineering by S. K. Sharma

3. Principles of Transportation Engineering by P. Chakraborty & A. Das.

ECE – 503

ENVIRONMENTAL ENGINEERING – I

L – 2, T – 1 CT – 15, TA – 10, ESE – 50

UNIT-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; per capita supply, basic needs and factors affecting consumption; design period.

Sources of water: Kinds of water sources and their characteristics, collection of surface and ground water; quality of surface and ground waters; factors governing the selection of a source of water supply; intakes and their design for lakes, streams and rivers, impounding reservoir and canal; determination of the capacity of impounding reservoir.

8

UNIT-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures.

6

UNIT-3

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, Newton - Raphson method and equivalent pipe method of pipe network analysis; rural water supply distribution system.

Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation. Institutional and industrial water supply.

8

UNIT-4

Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.

Storm water: Collection and estimation of storm water by different formulae.

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines; small bore sewer systems. Planning of sewerage systems. Institutional and industrial wastewater management.

9

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Arceivala: Wastewater Treatment for Pollution Control
6. Hammer and Hammer Jr.: Water and Wastewater Technology
7. Raju: Water Supply and Wastewater Engineering
8. Sincero and Sincero: Environmental Engineering: A Design Approach
9. Pandey and Carney: Environmental Engineering
10. Rao: Textbook of Environmental Engineering
11. Davis and Cornwell: Introduction to Environmental Engineering
12. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
13. Punmia: Water Supply and Wastewater Engineering Vol. I and II
14. Birdie: Water Supply and Sanitary Engineering
15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering

ECE - 504

STRUCTURAL ANALYSIS II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, Method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

8

UNIT – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

8

UNIT – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

8

UNIT – 4

Basics of Force and Displacement Matrix methods for beams , frames and trusses.

8

UNIT – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

8

Text Books

1. Advanced Structural Analysis by A. K. Jain, Nem Chand & Bros., Roorkee.

2. Structural Analysis by C. S. Reddy, Tata Mc Graw Hill Publishing Company Limited, New Delhi.

3 Theory of Structures Vol 1 & 2 by Gupta & Gupta , TMH

References

1. Theory and Analysis of Structures, Vol. I & II by O. P. Jain & B. K. Jain, Nem Chand & Bros., Roorkee.

2. Theory of Structures by S. P. Timoshenko and D. Young, Mc-Graw Hill Book Publishing Company Ltd., New Delhi.

3. Analysis of Statically Indeterminate Structures by P. Dayaratnam, Affiliated East-West Press.

4. Indeterminate Structural Analysis by C. K. Wang.

5. Introduction to Matrix Methods of Structural Analysis by H. C. Martin, Mc-Graw Hill Book Publishing Company Ltd.

6. Matrix Analysis of Framed Structures by Weaver and Gere.

7. Theory of Structures Vol. II by Vazirani & Ratwani.

8. Influence Line Diagrams by Dhavilkar.

ECE - 505

CONCRETE STRUCTURE I

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Concrete Making materials , mix design , Properties of concrete and reinforcements , testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. 8

UNIT – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method. 8

UNIT – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments. 8

UNIT – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations. 8

UNIT – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts. 8

Note : All designs shall be conforming to IS : 456 – 2000.

Text Books

1. IS : 456 – 2000.

2. Fundamentals of Reinforced Concrete by M L Gambhir, PHI,

3. Reinforced Concrete Design by S. Unnikrishna Pillai & D. Menon, Tata Mc-Graw

References

1. Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros.

2. Reinforced Concrete Structures by R. Park and Pauley.

3. Reinforced Concrete Design by P. Dayaratnam., Oxford & IBH

ECE – 551 Geotechnical Engineering Lab.

P – 3

1. Sieve Analysis
2. Hydrometer Analysis
3. Liquid & Plastic Limit Tests
4. Shrinkage Limit Test
5. Proctor Compaction Test
6. Relative Density
7. In Situ Density – Core cutter & Sand Replacement
8. Permeability Test
9. Direct Shear Test
10. Auger Boring
11. Static Cone Penetration Test
12. Standard / Dynamic Cone Penetration Test

ECE – 552 TRANSPORTATION ENGINEERING LAB.

P – 3

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate
5. Penetration Test of Bituminous Sample
6. Softening Point Test of Bituminous Sample
7. Stripping Test of Bituminous Sample
8. Ductility Test of Bituminous Sample
9. Flash & Fire Point Test of Bituminous Sample
10. Classified both directional Traffic Volume Study
11. Traffic Speed Study (Using Radar Speedometer or Enoscope)

ECE – 553 CAD LAB-1

P – 3

1. Working on analysis softwares like ANSYS , ADINA , NISA
2. WORKING ON DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. WORKING ON GEOTECHNICAL SOFTWARES like GEO-5 / Plaxis

ECE – 554 Quantity Surveying & Estimation

P – 3

1. Importance of estimation, different types of estimates specifications general and detailed.
2. Methods of Estimation: General items of work for estimates units and measurement, method of accounting for the deduction of openings etc.
3. Detailed estimates of a single roomed and a two roomed residential building.

4. Analysis of rates: Definition of analysis of rates, Prime cost, Work charged establishment,
5. Quantity of materials per unit of work for major civil engineering items
Resource planning through analysis of rates, market rates,
6. P.W.D. Scheduled and cost indices for building material and labour.
7. Public works Organization, M.E.S. Organization, India Railway Organization and concept of organizational set up for Public Work Execution. Duties and responsibilities of the officers.

ECE - 601

CONCRETE STRUCTURE II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method). 8

UNIT – 2

Analysis and design of beam curved in plan. 2

Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing. 6

UNIT – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. 6

Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert. 4

UNIT – 4

Design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground / underground, design of overhead tanks. 8

UNIT – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section. 8

Text Books

1. IS : 456 – 2000.
2. Reinforced Concrete Design by Pillai & Menon , TMH
3. Prestressed Concrete by N Krishna Raju , New Age

References

1. Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros.
2. Reinforced Concrete Structures by R. Park and Pauley.
3. Reinforced Concrete Design by P. dayaratnam.

ECE-602

ENVIRONMENTAL ENGINEERING – II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT-1

Introduction: Beneficial uses of water and quality requirements, standards.

Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater. Water borne diseases and their control.

Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc.

Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets. 8

UNIT-2

Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of primary and secondary settling tanks; removal efficiency for discrete and flocculent settling.

Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. 8

UNIT-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations; slow sand, rapid sand and pressure filters, backwashing; brief introduction to other filters; design of filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination.

Water softening and ion exchange: calculation of dose of chemicals. Adsorption. 8

UNIT-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes.

Primary Treatment: Screens, grit chamber and their design, sedimentation and chemical treatment to be given.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B. C. etc. 8

UNIT-5

Anaerobic digestion of sludge: Design of low and high rate anaerobic digesters and septic tank.

Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.

Disposal of wastewater on land and in water bodies.

Introduction to Duckweed pond, vermiculture and root zone technologies and other emerging technologies for wastewater treatment. 8

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).

Reference books:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Arceivala: Wastewater Treatment for Pollution Control
6. Hammer and Hammer Jr.: Water and Wastewater Technology
7. Raju: Water Supply and Wastewater Engineering
8. Sincero and Sincero: Environmental Engineering: A Design Approach
9. Pandey and Carney: Environmental Engineering
10. Rao: Textbook of Environmental Engineering
11. Davis and Cornwell: Introduction to Environmental Engineering
12. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
13. Punmia: Water Supply and Wastewater Engineering Vol. I and II
14. Birdie: Water Supply and Sanitary Engineering

15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering
17. Mara: Sewage Treatment in Hot climates.

ECE - 603

TRANSPORTATION ENGINEERING - II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Indian railways: Development and organization of Indian Railways.

Permanent way : Sub-grade, formation, embankment and cutting, track drainage.

Rails : Rail gauges, types of rails, defects in rails, rail failure, creep of rail.

Rail Fastenings : Fish plates, spikes, chairs, keys, bearing plates.

Sleepers : Timber, steel, cast iron, concrete and prestressed concrete sleepers, manufacturing of concrete sleepers, sleeper density.

Ballast : Ballast materials, size of ballast, screening of ballast, specification of ballast, tests on ballast. 10

UNIT – 2

Railway Track Geometry : Gradients, horizontal curves, super-elevation, safe speed on curves, cant deficiency, negative super elevation, compensation for curvature on gradients, track resistance and tractive power.

Points & Crossings : Elements of a simple turn-out, details of switch, details of crossings, number & angle of crossings, design of turn-out. 8

UNIT – 3

Stations & Yards : Site selection for a railway station, layout of different types of stations, classification of stations, types of railway yard, functions of Marshalling yards.

Signalling & Interlocking : Classification of signals, method of train working, absolute block system, mechanical interlocking of a two line railway station. 7

UNIT – 4

Airport Engineering

Air craft characteristics affecting airport design; Runway operation; Runway pavement design, design of overlay; Runway lighting and marking heliport.

UNIT – 5

Water Transport

Harbors; Layout and port facilities; Inland waterways; Inland water operation.

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena

References

1. Railway Engineering by M. M. Aggrawal.

ECE-651: Structural Detailing Lab (L-T-P:: 0-0-3)

Preparation of working drawings for the following using any drafting software

1. RC Beams- Simply supported, Continuous, Cantilever
2. T – beam / L-beam floor
3. Slabs – Simply supported, Continuous, One way and two way slabs.
4. Columns – Tied Columns and Spirally reinforced columns.
5. Isolated footings for RC Columns.
6. Combined rectangular and trapezoidal footings.
7. Detailing of Buildings with respect to Earthquake Resistant Design.

ECE-652: Environmental Engg. Lab (L-T-P:: 0-0-3)

Any 8 Experiments out of the list of 12 below:

1. Determination of turbidity, colour and conductivity.

2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of most probable number of coliforms.
6. Measurement of air pollutants with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.

ECE-653 : CAD Lab – 2 (L-T-P:: 0-0-3)

1. Working on Environmental Engineering softwares for Analysis and Design of water & waste water treatment and distribution systems (Water Cad / Sewer Cad / Water Gem / Sewer Gem / Loop)
2. WORKING Transportation Engg softwares / Surveying Softwares
3. WORKING ON GIS softwares (Arc GIS / Envi / GePSy)
4. Working on Project Management softwares (Primaveera / MS Project)

ECE – 701 STEEL STRUCTURE I

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria

Unit -2

Simple Connections--Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Pin Connections

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Section of Fasteners, Working Load Design

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Encased Column, Splices, Design of Column Bases

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Lintels, Purlins, Beam Bearing Plates, Castellated Beam, Effect of Holes in Beam, Introduction to Plate Girder, Introduction to Gantry Girder

Text Books

1. *Limit State Design of Steel Structures* by S. K. Duggal, Tata Mcgraw Hill.
2. *Design of Steel Structures* by K S Sairam, Pearson Education

Reference Books

3. *Design of Steel Structures* by N. Subramanian, Oxford University Press
4. *Steel Structures* by Robert Englekirk. Hohn Wiley & sons inc.
5. *Structural Steel Design* by Lambert tall (Ronald Press Comp. Newyork.
6. *Design of steel structures* by Willam T Segui, CENGAGE Learning
7. *Structural Steel Design* By D MacLaughlin, CENGAGE Learning

ECE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilistic maximum Precipitation (PMP) curves.

Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.

Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices.

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships
Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.

Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.

Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation

Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's

Design procedure for irrigation channels, Longitudinal cross section, Schedule of area

statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programmes for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining.
Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects

Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion

River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries.

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.

References

5. Water Resources Engg. By Larry W. Mays, John Wiley India
6. Water resources Engg. By Wurbs and James, John wiley India
7. Water Resources Engg. By R. K. Linsley, McGraw Hill
8. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
9. Irrigation Theory and practices by A.M. Michel.

ECE – 801

CONSTRUCTION TECHNOLOGY & MANAGEMENT

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

L 3 T 1

Unit – 1

Elements of Management : Project cycle, Organisation, planning, scheduling monitoring updating and management system in construction.

Unit -2

Network Techniques : Bar charts, milestone charts, work break down structure and preparation of networks. Application of network Techniques like PERT, GERT, CPM AON and AOA in construction management. Project monitoring, cost planning, resource allocation through network techniques. Line of balance technique.

Unit – 3

Engineering Economics : Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison present worth

method Equivalent annual cost method, discounted cash flow method, analytical criteria for postponing of investment retirement and replacement of asset. Depreciation and break even cost analysis.

Unit – 4

Contract Management :Legal aspects of contraction, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items, settlements of disputes, arbitration and commissioning of project.

Unit – 5

Equipment Management : Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipments for earth moving , Hauling Equipments, Hoisting Equipments , Conveying Equipments , Concrete Production Equipments

Text Books

1. “Construction Planning”, Equipment and Methods. : R.L. Peurify. T.M.H., International Book Company.
2. “PERT & CPM Principles and Applications” L.S. Srinath, E.W.P. Ltd., New Delhi.
3. “Network Analysis Techniques” S.K. Bhatnagar, Willey Eastern Ltd.
4. Construction Technology by Sarkar , Oxford

ECE 011 Advanced Foundation Design

L	T	P
3	1	0

Unit -1

Vertical pressures under surface loads, Elastic Solution, Boussinesq and New Mark Charts, Westergaard's equation, approximate solution.

Unit -2

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and schmertman's methods of settlement prediction in non cohesive soil.

Unit -3

Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

Unit – 4

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles.

Elements of well foundation, Shape, Depth of scour, Well sinking, Tilt, shift and their prevention.

Unit -5

Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts.

Machine foundation: classification, definitions, design principle in brief, Barken's method.

Text Books:

1. K. R. Arora – Soil Mechanics & Foundation Engineering.
2. Alam Singh – Modern Geotechnical Engineering.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics

Reference:

1. J. E. bowles – Analysis and Design of Foundation.
2. V. N. S. Murthy – Soil Mechanics and Foundation Engineering.
3. B. M. Das – Foundation Engineering , CENGAGE Learning

ECE – 012 MATRIX ANALYSIS OF STRUCTRES

L – 3, T – 1
CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2

Hand computation of problems on trusses, frames and grids.

UNIT – 3

Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Reference:

1. Weaver & Gere , Matrix Analysis of Framed structures.
2. H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill, New York.

ECE-013 Environmental Management for Industries

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources & solid wastes, noise emissions, radiation emissions etc.; Biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC): Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Recommended References:

1. EIA Guidelines of MoEF Available on CPCB/MoEF Website

2. Environment (protection) Act- 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website
3. Environmental Impact Assessment-Training resource manual, UNEP 2001
4. Wastewater Reuse and Recycling Technology-Pollution Technology Review-72, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
5. Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
6. Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.
7. Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi

ECE – 014 Principles of Town Planning and Architecture

Unit - 1

Principles of town planning, Land use patterns, Population survey, Density concepts, and transportation planning,

Unit - 2

Concept of habitat including environmental pollution, problems of metropolis, Satellite town concepts, Garden city movement, Neighbourhood planning, Brief history of architecture,

Unit -3

Impact of development of materials through ages, Evolution of architectural forms, Anesthetics and functional proportions,

Unit - 4

Principles of architecture Design, Building Bye-Laws, Scale, Forms, Texture, Colour, Balance, Composition of Space, Role of architects and town planners,

Unit - 5

Architectural Drawing, Different symbols used in building industry, Design of typical buildings such as school, hospital, residential and commercial complex, etc.

ECE – 021 ADVANCED CONCRETE DESIGN

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects.

UNIT – 2

Design of staging: Braces, Columns and Raft Foundation.

UNIT – 3

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

UNIT - 4

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under concentrated loads using, Effective width and Pigeaud’s method, Courbon’s method of load distribution, Detailed design of Highway Bridges: RC slab, and R.C. T-beam types.

UNIT – 5

High performance concrete, Production and no-conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Reference:

1. Reinforced Concrete Design by M L Gambhir
2. Reinforced Concrete Design by B C Punamia
- 3 Essentials of Bridge Engineering by D.J. Victor

ECE 022 Earth and Earth Retaining Structure

L T P
3 1 0

Unit -1

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis

Unit -2

Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability.

Unit -3

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design.

Unit – 4

Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface friction,
Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure

Unit -5

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Books:

1. V N S Murthy – Soil Mechanics and Foundation Engg
2. Swami Saran – Reinforced Soil and its Engineering Application
3. J. E. Bowles – Analysis and Design of Foundation

TCE – 023 Transportation System Planning

L – 3 T – 1 P - 0

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning,

UNIT-2

Type of transportation system: Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

UNIT-3

Travel demand: Estimation and fore casting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method.

UNIT-5

Transportation Facilities: Pedestrian facilities, Bicycle facilities, parking and

terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation.

Reference:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning – E.K. Mortak.
3. Metropolitan transportation planning – J.W. Dickey.
4. Traffic Engineering, L.R. Kadiyali

ECE-024 : Rural Water Supply and Sanitation

Unit-I

Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Population to be covered, difficulties. National policy.

Unit-II

Water supply: Design population and demand loads. Various approaches of planning of water supply schemes in rural areas. Development of proffered sources of water springs. Wells, infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source. Specific practices and problems encountered in rural water supply.

Unit-III

Improved methods and compact systems of treatment of surface and ground waters for rural water supply. Brief Details of multi-bottom settlers (MBS), diatomaceous earth filter, cloth filter, slow sand filter, chlorine diffusion cartridges. Pumps, pipe materials, appurtenances and improved devices for use in rural water supply. Planning of distribution system in rural areas.

Unit-IV

Community and sanitary latrines. Various methods of collection and disposal of night soil. Planning of waste water collection system in rural areas. Treatment and Disposal of waste water. Compact and simple waste water treatment units and systems in rural areas such as stabilization ponds, septic tanks, Imhoff tank, soak pit etc. Disposal of waste water soakage pits and trenches.

Unit-V

Disposal of Solid Wastes. Composting, land filling, incineration, Biogas plants, Rural health. Other specific issues and problems encountered in rural sanitation

Recommended books:

1. 'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.
2. 'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N., WHO
3. 'Water Supply and Sewerage', by E.W.Steel & T.J.McGhee, McGraw Hill.
4. 'Manual on Water Supply and Treatment', CPHEEO, Mini. Of Urban Development, Govt. of India.
5. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Mini. Of Urban Development, Govt. of India
6. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009

ECE 031 Bridge Engineering

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method,

Unit – 2

Courbon's method of load distribution. Detail design of slab culvert

Unit – 3

T-beam bridge, box culverts,

Unit – 4

Design and detailing of plate girder and steel Truss type bridges,

Unit – 5

Design of piers and pier caps. Abutments, and bearings

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra

ECE 032 Finite Element Methods**Unit - 1**

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. (08 Hrs)

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equations by Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrilateral elements. (10 Hrs)

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super-parametric elements, Concept of Jacobin matrix. (04 Hrs)

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, (05Hrs)

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermitian shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Lagrange's formula, Plane stress problems. (08 Hrs)

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method.

Analysis of frames and different problems, Different axi-symmetric truss problems. (08 Hrs)

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval, PHI
3. Finite Elements in Engineering:- Chandrupatta, et. Al. Prentice Hall of India Pvt. Ltd.,

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John Wiley & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

ECE 033 Environmental Geotechnology

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3 1 0

Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems.

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems.

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics

ECE – 034 Industrial Pollution Control and Environmental Audit

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes- solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial processes requiring water use and water quality.

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent.

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management.

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000.

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark, V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes*. Edmund, B. Besseliave P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use*. Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook*. Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering*. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986*. Any authorized & recent publication on Government Acts.

ECE-035 : Engineering Hydrology

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, application in engineering. Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation.

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities, indices, measurement & estimation

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs.

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing.

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting.

Recommended Books:

- *‘Hydrology for Engineers’* by Linsley R. K., Kohler M. A. and Paulhus J. L. H.
- *‘Engineering Hydrology’* by K. Subramanya
- *‘Hydrology: Principles. Analysis. Design’* by Raghunath H. M.
- *‘Handbook of Applied Hydrology’* by Chow V. T.
- *‘Irrigation: Theory & Practice’* by Michael A. M.

ECE- 041 Precast and Modular Construction Practices

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of precast/prefabricated building components,

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance,

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability,

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction.

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

ECE – 042 Plastic Analysis of Structures

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor.

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames.

Unit – 3

Semi Graphical method and Mechanism method.

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames.

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear.

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

ECE- 043 : Open Channel Flow

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3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions.

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,

Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater,

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, “Celerity” of the gravity wave, deep and shallow water waves, open channel positive and negative surge,

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack.

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert.

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International

ECE 044 - Tunnel Engineering

Unit – 1

Site investigations , Geotechnical Considerations of tunneling

Unit – 2

Design of Tunnels

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels

Unit-4

Micro tunneling techniques , Tunnel support design

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski

ECE – 051 COMPUTER AIDED DESIGN

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design.
Hardware required for CAD works.

UNIT – 2

Principles of software design, concept of modular programming, debugging and

testing.

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems.

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields.

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks.

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lertner & / Lane E. Drang, McGraw Hill
3. “Neural Computing: Wasserman, vonnostrand.

ECE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L – 3, T – 1

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh’s theory, Khosla’s theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis fall.

Principle and design of Distributory head regulator and cross regulator, canal escape, Bed bars.

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works.

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method. Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis.

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks.

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of power plants, important terms, types of turbines and their suitability.

Power House layout and important structures of a powerhouse.

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill

4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers

6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

ECE 053 WATER RESOURCES SYSTEMS

L T P
3 1 0

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis.

Unit-II

System Techniques in Water Resources: Optimization using calculus, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization.

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection.

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation.

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elsevier, Amsterdam

ECE 054 Machine Foundation Design

L T P
3 1 0

Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped.

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken’s approach, Ford & Haddow’s analysis, Hammer foundation, I. S. Codes.

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers.

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers.

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations

ECE 061 Ground Improvement Techniques

L	T	P
3	1	0

Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes.

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test

Unit -5

Underpinning of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage.

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics

ECE 062 RIVER ENGINEERING

L	T	P
3	1	0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes.

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration.

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data.

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works.

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.

ECE-063: Groundwater Management

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium.

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single & Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters,

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation.

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage,

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge.

Recommended References:

- 'Groundwater Hydrology' by Todd D. K.
- 'Groundwater Resource Evaluation' by Walton W. C.
- 'Groundwater' by Raghunath H. M.
- 'Handbook of Applied Hydrology' by Chow V. T.
- 'Irrigation: Theory & Practice' by Michael A. M.

ECE – 064 EARTQUAKE RESISTANT DESIGN

L3 T1

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes,

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system,

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, Dynamics of soils and seismic response, Conceptual design, I

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Design of Masonry buildings,

Unit – 5

Reinforced Concrete buildings, Steel Buildings, Material Properties, Code provisions.

Introduction to machine foundation. Degrees of freedom of a block foundation. I.S. code provisions for design and construction of machine foundations.

References:

1. Introduction to Structural Dynamics - J.M. Biggs
2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srihande.
7. Earthquake Resistant of Design of structures, S.K.Duggal